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American Security and Foreign Oil

BY BERNARD BRODIE

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American Security and Foreign Oil

BY BERNARD BRODIE

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THE politics of oil are marked by dangerous confusion. Both the confusion and the danger stem from the fact that while petroleum is of supreme importance strategically as well as economically, little effort has been made to distinguish between the strategic and the economic interests involved. The United States has always been, and is bound long to remain, far the greatest consumer of oil in peacetime; and the military machine it created in two world wars was geared to the same prodigal rate of consumption. The United States also has thus far furnished the major part of the world's supply of petroleum—but its ability to continue to do so or even meet its own needs is about at an end. The most obvious alternative source of supply —the Middle East—happens to be one of the great trouble areas of the world politically, and the existence there of petroleum in unparalleled abundance is not likely to alleviate the difficulties endemic to it. Nor is the danger of conflict lessened by the circumstance that the Middle East area lies on the threshold of the Soviet Union.

The interest of the United States government in assuring adequate supplies of oil to the nation ought to and does embrace economic as well as strategic needs. But where the policies suggested by those respective needs diverge, as they do at crucial points, strategic consideration must command first attention. It is not so much that the requirements of security are deemed to be the primary responsibility of government, taking precedence over all other responsibilities—although even the authors of the Federalist Papers thought this to be the case. It is rather that the economic interest involves a consideration mainly of price differential with respect to a commodity which is, after all, only marginal in the budget of the average citizen, while the strategic interest concerns the life or death of the nation.

It may be stated categorically at the outset—despite the relative tightness of the oil supply at this time—that there is no danger the American consumer will ever seriously lack in peacetime the liquid fuels which seem to be so important to him.[1] When the domestic supply of petroleum is no longer adequate he will supplement it either by imports from abroad, which ought to be very cheap; or by production of synthetics, which will be more costly but not enough to burden him unduly; or by a combination of both. The strategic issue is not so easily resolved. For one thing, the strategic aspect of the petroleum question places a far higher premium on foresight than the economic aspect. No abrupt collapse of domestic production is anticipated in time of peace. Decline in domestic yield, when it comes, will be relatively gradual, and the period of decline will permit all kinds of adjustments as occasion for them arises. A war situation, on the other hand, could well see a sudden and drastic adverse change in the supply situation, with no time permitted for adjustment.

MILITARY PETROLEUM REQUIREMENTS

What the atomic bomb will mean for the military importance of petroleum is difficult to predict at this time. The answer depends on a great number of variables, among which are the probabilities of success or failure of the current effort to obtain some workable system of international control of atomic energy. It is by no means obvious

1. The present (mid-1948) shortage is due to the unprecedented and largely unexpected rise in demand coupled with a scarcity of equipment for the rapid expansion of transportation and refining facilities. It is not—or rather, not yet—a question of available reserves of crude petroleum.

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that the atomic bomb, even if available in substantial numbers to both belligerents in a future war, would reduce the requirements of liquid fuel for the duration of hostilities. Use of atom bombs would indeed have the opposite effect, for reasons which in the main concern the much higher premium placed upon air-borne transportation of troops and military supplies. What effect it might have upon the duration of hostilities again depends on a number of variables, above all those affecting the number and distribution of bombs in existence. However, one thing is certain. Governments are not going to write down the military importance of liquid fuels and lubricants until they have the answers to the above questions, and that may not be for a very long time to come.

There is a series of much-quoted statements from Clemenceau, Lloyd George, Curzon, and others to the general effect that the Allies of World War I "floated to victory on a sea of oil." If that was true of World War I, how much truer it proved of the recent war! Our over-all output of gasoline for military use was about eighteen times as great in the latter stages of World War II as in the earlier war, and that of aviation gasoline about eighty times as great. Approximately half the tonnage of supplies which the United States shipped to her fighters overseas was devoted to some form of petroleum derivative.

Navies, which in World War I were still predominantly coal-propelled, subsequently became wholly oil-driven. One of the advantages of this shift was that ships could refuel from oilers or from larger warships while at sea—a factor without which the type of sustained operations carried out in the western Pacific during 1943-45 would have been impossible. And even without refueling, the ship which burns oil has at least 40 per cent more cruising radius than it would have if it had to burn coal. Because it burns liquid fuel a large modern aircraft carrier could go to the southwest Pacific and back without refueling, but in doing so it would use about 18,000 barrels[1a] of fuel oil—or enough to heat the average home for more than three centuries.

American armed forces used only about one-third of our domestic production of oil, which averaged during the later phases of the war approximately 4.7 million barrels per day—or over 1 million more barrels of crude oil per day than was being produced in 1938. The remainder went into war-expanded American industries, including transportation, and into the armed services and industries of our Allies. But in any case the annual American production of crude petroleum, which in 1938 had reached something over 1.2 billion barrels, under the impetus of war reached the figure of 1.6 billion barrels in 1944. But even this breath-taking figure was exceeded in the first full peacetime year of production following the war. And today we are producing at record levels which are constantly being pushed upward.

One cannot venture to predict within meaningful limits the petroleum needs of our armed forces if they should become involved in another great crisis some twenty-five or thirty years hence—even after the vast maze of uncertainties provoked by the atomic bomb is arbitrarily disposed of. As our Army becomes increasingly air-borne and air-supplied, and as firepower of individual weapons increases, fuel consumption per combatant soldier is bound to rise drastically—and indeed to become the limiting factor in further mechanization. Also, while engines become more efficient and therefore do a given amount of work with a lesser consumption of fuel, we know from experience that the increased efficiency of engines is always more than offset by the pursuit of greater tactical performance.

It has been argued that American military consumption during the recent war was quite prodigal, in fuel as in everything else, as compared with that of our enemies. The implication is that we could have managed with a great deal less than we did, just as the Germans functioned very well for a time on a fuel consumption which even at its peak was a small fraction of ours. It is true that our enemies accomplished great things on a far lesser raw material base than we ultimately required. But we, unlike them, fought major campaigns at great distances from our shores, and our tremendous industrial productivity enabled us to saturate our combat forces with mechanized material and munitions which greatly increased our fuel needs and, incidentally, saved lives and made much more effective our relatively limited combat personnel. It is unlikely that the United States in preparing against some future crisis would voluntarily relinquish either the opportunity to fight abroad rather than at home or the ability to translate great industrial strength into military power.

For the time to come, all one can predict is that the armed forces of the future will consume liquid fuel at a rate per combatant person at least as great and probably much greater than the armed forces of today. Moreover, industrial and private use of petroleum products, unless deliberately checked, will also tend to increase. Thus, the 1.6

1a. The standard barrel of oil measures exactly 42 gallons. Since some oil statistics are given in tons, it is worth noting that there are approximately 7½ barrels to the short ton (2,000 lbs.).

billion barrels per annum production which just sufficed to meet our needs in 1944-45 would not begin to meet the needs of a possible emergency.

STRATEGIC VS. ECONOMIC APPROACH

There are two essential differences between the armed services and civilian consumers with respect to liquid-fuel needs. First, the armed services in wartime not only consume oil on a far greater scale than in peacetime, but are also unable to accept any qualification of availability which might tend to impede their operations to a substantial degree. The civilian, on the other hand, may drastically reduce his consumption of petroleum products during wartime, and even the war-expanded industrial need for fuel may be satisfied in a relatively flexible manner by the considerable substitution of coal for liquid fuel.

The second and more basic difference is that location of reserves is of transcendent importance to the military and of relatively little importance to industry or commerce as a whole. In peacetime oil is an ordinary commodity of domestic and international trade, and is available to all consumers, including the armed forces of any state, on a simple purchase basis. Whether it is derived from fields at home or abroad makes absolutely no difference to the consumer except in so far as transportation costs may be affected, or as there may exist foreign exchange problems and other artificial barriers to international trade.

During wartime, however, oil becomes the most important of all strategic raw materials, and belligerents will wage great campaigns on land or sea to gain access to oil or to deny it to the enemy. The question of who has legal title to the oil is then of practically no importance; the question of who has military control of the area in which it is produced and of the land and sea routes over which it flows is all important.

The United States has hitherto been so great a producer of oil that, despite its own tremendous consumption, it had until recently a regular export surplus. During World War II American oil wells, with help from the Caribbean, met the greater part of the needs not only of our own armed forces and military industries, but those of Britain and various other of our Allies, as well as a very substantial part of the needs of the Soviet Union, especially in aviation gasoline. The possession within our own territory or close to it of a vast fund of readily available oil, which was not only completely secure from the enemy but was also on the whole advantageously placed as concerned transportation to places of need, proved a military advantage of the utmost importance. Retention of this advantage must therefore become the first and fundamental goal of a strategic oil policy.

The United States Navy has thus far enjoyed an advantage shared by no other great navy, whether friendly or hostile. The immediate security of the nation has never in any important sense depended upon oil imports from abroad.[2] On the contrary, control of the sea lanes has been militarily valuable to us chiefly as a means of enabling us to assist our Allies with our great resources and to send our armies and air forces abroad where they could come to grips with the enemy on his own threshold. In so far as our Navy had to concern itself with the security of shipping, that shipping was militarily important mainly as a means of exporting men and commodities rather than of importing them. This meant that American overseas commitments and operations during the recent war had that flexibility which results from possessing a certain margin of choice between military goals. Moreover, once our Allies and ourselves were ready for offensive operations, our naval strength could be devoted almost entirely to supporting those offensives, wherever in the world they happened to be taking place.

The United States has not thus far had to depend for its sustenance in wartime upon defense of a long "life-line" over which an essential commodity was moved in large volume. And in so far as our Allies have had to depend upon such a line, that line usually extended from them to us rather than to any remote area of the globe. The much-touted British "life-line of Empire" through the Mediterranean to India has never in recent times been nearly as important to England as the line across the Atlantic. This is particularly true in the case of oil, which in the two world wars Britain received predominantly from us. Britain therefore has a strategic stake hardly less than ours in the conservation of oil in America.

If, however, we were to become dependent mostly or even largely on such an area as the Middle East for our supplies of oil in wartime, we would be accepting an enormous handicap, a fact sufficiently demonstrated by the difficulties we experienced in the coastwise and Caribbean trans-

2. This has been true except in terms of coastwise or semi-coastwise shipping. One is forcefully reminded of the acute oil shortage suffered by our northeast coast area during the first and second quarters of 1942 as a result of German U-boat depredations against tankers sailing from our own Gulf ports and from the Caribbean region. However, these submarines, operating in shallow waters far from their bases, were rather easily brought under control once the minimum necessary forces of antisubmarine vessels and aircraft were provided.

portation of crude oil by tanker during the recent war before the submarine menace was mastered and interior pipe lines were built. For regardless of where on the globe military operations had to take place, our primary concern would have to be with protecting what might easily prove to be a tenuous line of sea-borne communications from the Middle East to our own shores—a line which except for our dependence on oil we might have no military interest in maintaining. Even that proposition assumes that the area in which the oil originates remains out of enemy hands. The fact is that for the United States the Middle East is one of the most insecure areas of the globe. For the time being, all American strategic calculations concerning the requirements of major wars must envisage the Soviet Union as the opponent, if for no other reason than that it is the only foreign power whose defeat would require great exertions on our part.

Whether it is possible to defend that area against the Soviet Union is not at issue. It is by no means out of the question, in view both of the character of the terrain connecting the oil regions with the centers of Soviet power, and of Soviet deficiencies thus far in overland transportation, that it could be defended by a mobilized America, with or without major allies. But whether the oil itself, or its denial to the opponent, would be worth the price required to defend it is quite another matter. So long as any feasible alternative remains, the answer must almost certainly be no. The "almost" is contingent first upon whether the alternative is available at a lesser price in manpower and physical resources. It is also contingent upon whether there are other objectives within the area the defense of which was so high a priority as to carry the petroleum objective with it.

For example, we must consider the view that the area in question might provide an excellent staging base for an offensive, and that while neither offensive nor defensive objectives taken separately could furnish a sufficient justification for holding the area, the combination of those objectives might well do so. A case in point is that of the British Isles during the recent war, which had to be defended anyway and which ultimately provided the ideal base for invasion of the continent. But what the British Isles contained was of far greater value than oil pools. Moreover, as the recent Pacific war proved, the area which will ultimately serve as the staging base for final and decisive attack is not necessarily one that must be held in the beginning. And in strategy as in other affairs of life, the objective which fulfills too many purposes is not likely to serve any one of them well.

The strategic approach to the oil problem must be based on the premise that, so long as it can be made to fulfill our basic wartime needs, the only oil reserve worth defending is that which can be held with a minimum of defensive military commitments. That portion of it which falls within the area we must in any case defend is pure windfall strategically. Since the United States, the Caribbean, and the northern part of South America clearly fall within our "minimum strategic defense area," a sound strategic oil policy must stem first of all from an accurate appraisal of reserves within that area, both of crude petroleum and of alternative sources of liquid fuel. It must also consider productive capacity in the area and the degree to which that capacity lends itself to rapid expansion, for oil in the ground is not necessarily available on demand. This does not preclude interest in other areas even for wartime needs, since such areas may be accessible to us during an emergency. But for the most part our interest in distant overseas oil fields is either purely economic or is based on the desire to exploit those areas in order to help conserve American reserves for military emergencies.

HOW MUCH OIL CAN WE COUNT UPON?

The real extent of potential American reserves in crude petroleum is a subject of bitter controversy. Within the oil industry itself, there are in general two groups with fairly distinctive interests. One is represented by the so-called "major" producer—the large, integrated corporation, such as Standard Oil of New Jersey, Standard Oil of California, the Texas Company, Shell Union Oil, Socony-Vacuum, or the Gulf Oil Corporation. Such companies usually list among their crude reserves large holdings abroad, and in any case they are interested in refining and distribution as well as in crude production. The Socony-Vacuum Oil Company, for example, has always been a large purchaser of crude oil on balance, its own crude production usually amounting to substantially under 50 per cent of its refinery requirements. Although such companies also invariably possess within the United States great holdings of crude reserves and extensive leasings of areas considered promising, their interests are sufficiently hedged to permit them to adopt a fairly objective view of the world-wide oil situation. On the other side are the so-called "independents," who are interested mainly in producing and selling crude oil and whose properties usually consist predominantly if not wholly of domestic reserves.

Firms in the latter group naturally look upon any kind of foreign production, and especially upon importation, as competition. They therefore share with American producers of other commodities a favorable attitude towards tariff protection and a desire for complete freedom in the exploitation of their reserves. In order to allay fears which might result in marked governmental interference in their operations, they are given to publicizing estimates of our domestic reserves which stress maximum possibilities. Their conception of the ideal way to meet the threat of diminishing domestic supply is generally one in which a steadily rising tariff schedule or other form of import restriction offsets the rise in costs of production resulting from advancing depletion of American fields. Our vast resources in hydrocarbons for synthetic production of liquid fuel are held up as the ultimate insurance against strategic and economic embarrassment.

EXISTING OIL RESOURCES OF THE U.S.

The oil resources of the United States must be considered in terms of proved reserves of crude petroleum, probable future discoveries, relation of size of reserves to rate of production, proved reserves of alternative sources of liquid fuel, and the technological and economic availability of those alternative sources for actual production.

So far as current proved reserves of crude petroleum in the United States are concerned, there is no controversy. The standards used for determining proved reserves are set by the American Petroleum Institute, which is currently presenting a figure of something over 21 billion barrels. However, it is legitimately pointed out by many oil people that the API standards are extremely conservative. For one thing, the API method is to confine estimates of proved reserves to those proved by actual drillings. But the state of the art of drilling is such that there are frequent instances where we can be sure there are oil reserves, and even estimate their size with reasonable accuracy, without having done all the drilling required by the API standard. Moreover, the proved reserves are customarily calculated at about 40 per cent of the petroleum contained in the natural reservoirs to which the estimates apply, because that represents the average proportion recoverable in the past by conventional methods. However, methods of secondary recovery in so-called "stripper" wells do appreciably increase the proportion recoverable, and techniques are constantly evolving for pushing still higher the ratio of recovery.

It should also be clear that a fund of proved reserves some twelve or fourteen times greater than the current annual consumption does not mean the country's visible supply will last only fourteen years—a deduction implicit in the often repeated assertion that "we can count only on what we know we have." It would in fact be physically impossible to withdraw the present proved reserves of the country within fourteen years—due simply to the fact that, as a given field approaches depletion, its rate of production declines. The proved reserves must be looked upon rather as a fund which supports a certain optimum economic rate of withdrawal, the continuation of which depends on new accretions to the proved reserves to replace those withdrawn—in other words on the further development of existing fields and the discovery of new ones. It is as close to an absolute certainty as anything can be that we will continue to discover new oil within the country. To that extent we can count on "more than we know we have." The question is how the rate of domestic discovery will compare with our advancing rate of domestic consumption.

POTENTIAL OIL RESOURCES IN THE U.S.

The amount of oil still to be discovered in the United States is obviously a matter of speculation, and estimates vary enormously. Some oil experts maintain that there is more oil waiting to be found than has yet been discovered. Others point out that the bulk of present American production comes from flush wells—that is, about 85 per cent of the volume comes from 8 to 10 per cent of the wells—and that the rich fields which produce flush wells are not nearly so likely to be discovered in the future as they have been in the past.

In the past estimates of oil reserves in this country have consistently turned out to be far too pessimistic. An unfortunate result of this has been a tendency to reason that, since our estimates proved too pessimistic before, they are undoubtedly too pessimistic today, and that our figures of domestic proved reserves will go on mounting in the future as they have in the past. One cannot, however, discount the fact that while a greater number of wildcat wells were drilled in the United States in 1946 than in any earlier year, the really new oil added to reserves was the lowest of any year in at least the last thirty.[3] The substantial additions to proved reserves were due to reappraisal and upward revision of known fields, as well as to extension of the productive areas of those fields. The new pools discovered appear to be relatively unim-

3. See the Texas Company, *Annual Report for the Year 1946*, pp. 5 ff. The figures for 1947 are at this writing not yet available.

portant. The experience of 1946 clearly goes a long way toward demolishing the argument frequently ventured during the war: that the disappointing exploratory results of recent years were due primarily to the inhibiting effect of war needs and shortages on the more speculative kind of wildcatting. On the other hand, the discovery early in 1948 of the apparently rich Benedum Field in west Texas indicates that the finding of lush fields is not wholly a thing of the past.

Much has been heard of late of the vast oil reserves of our continental shelf, especially that part of it lying off existing oil fields on the coasts of California, Louisiana, and Texas. The continental shelf, which by definition lies at a depth of less than 100 fathoms (600 feet), varies considerably in width, but on our Texas coastline it extends out to sea some twenty-eight miles. That there are numerous structures favorable for the occurrence of oil in that shelf is not only a reasonable expectation from coastal occurrences but has been definitely established from geophysical surveys carried out by several oil companies. However, the business of drilling wells miles out at sea is quite another matter. There are already productive wells in operation over water, especially at Lake Maracaibo in Venezuela, but nowhere at more than 100 feet of water depth or at more than ten miles from shore. Even those oil men who are conspicuously optimistic concerning our crude oil potential concede that on a basis of relative costs the continental shelf is far less promising than synthetic production of liquid fuel from coal. In other words, the shelf is likely never to be exploited to any significant degree unless our oil need should "become so imperative as to make producing cost a secondary consideration,"[4] a situation which could occur only during war or under imminent threat of war. And even then the oil of the shelf would not be available unless we had previously developed the necessary techniques and provided the requisite equipment.

Returning to the situation ashore, a good deal obviously depends on technological progress in oil-finding and oil-producing techniques. It has been estimated that probably three-quarters of the discoveries of new oil pools during the last fifteen years would not have been made except for seismic methods of sounding which did not even exist in 1918, and which, incidentally, developed largely from scientific work concerned with locating large enemy guns during World War I. On the other hand, some experts also believe that the kind of "textbook" structures to which these and other methods are most applicable have already been largely surveyed within the United States, and that new methods are necessary if the recent rate of discovery is to be maintained or improved upon. A revolutionary advance would ensue if some method were found for mapping out stratigraphic traps, which at present defy any type of sounding other than the drill itself.

Barring the advent of such an invention, it seems a sound deduction from the available evidence that the costs of exploration, and hence of production, within the United States are bound steadily to rise relatively to alternative sources of liquid fuel. Whether those "alternative sources" take the form of imported petroleum or synthetic production or both depends largely on governmental policy, especially as regards the tariff. The independents are already pressing for a restoration of the full 21 per cent per barrel import duty on crude petroleum, which was effectively halved as a result of the generalization, under "most-favored-nation" clauses, of our reciprocal trade agreements with Venezuela and Mexico.[5] Disregarding its effect on American trade policy in general, such a restoration would have meaning mostly as a prelude to further boosts.

There is little question that we can find within the country enough oil to fill the major part of our needs for a long time to come if we are determined to prevent any large influx of foreign petroleum. Moreover, ultimately the rising price of domestic crude oil would enable synthetic production to become commercially competitive. There is no potential shortage in any absolute sense to worry about, but there is an important question of costs. And there remains also the question of which policy would assure us of the greatest domestic supply in a military crisis.

It would seem that the best and cheapest way of assuring ourselves of the greatest possible fund of domestic proved reserves during war would be to relieve the drain on our resources in peacetime by relying heavily on imported petroleum. But, for reasons which will shortly be presented, it by no means follows that such a policy would actually maximize the proved reserves available for an emergency.

OTHER WESTERN HEMISPHERE PETROLEUM RESOURCES

The distinction several times made in the preceding paragraphs between "domestic" and "imported" petroleum may be somewhat misleading

4. See Wallace E. Pratt, "Continental Shelf," *The Lamp* (bimonthly publication of the Standard Oil Co. of New Jersey), March 1947, pp. 19-21. The quoted passage above is from the editorial comment on that article.

5. See *New York Times*, January 2, 1947.

when applied to other Western Hemisphere countries. For while trade statistics consider all petroleum resources outside the United States as indisputably foreign, from the strategic point of view those situated in Latin America or Canada are available—with qualifications—to a degree comparable with domestic resources. The qualifications, which will be reviewed in a moment, are extremely important. But it is nevertheless worth while to point out that our strategic goals are not advanced very much by a policy of importing oil in order to spare our own when those imports come mostly from other parts of the Americas.

The qualifications upon considering Latin American petroleum as strategically domestic are in general twofold. The first and least important concerns the vulnerability of transportation. The oil of Venezuela is shipped to the refineries of our Eastern seaboard by tanker. So, too, is the oil produced in our own Gulf region; but for the latter there are alternative means of shipment, such as the great pipe lines built during the war as an emergency measure. No such alternative exists for the petroleum of the Caribbean and of the South American continent. However, if the whole experience of World War II rather than that of a few months in 1942 is taken as a yardstick, this dependence upon what amounts to coastwise transportation is not too serious. At any rate, communications to Latin America are likely to be far less vulnerable than those extending to the Middle East. It is for that reason mainly that we consider the petroleum resources of Latin America as within our "strategic sphere."

Much more important is the fact that the oil policies of Latin American countries are subject neither to the control nor even the appreciable influence of our government. The expropriation of foreign oil interests by the Mexican government and the decidedly negative attitude of various other Latin American governments towards development of their oil resources by foreign enterprise, American or otherwise, indicate that the potential oil resources of the Americas in a physical sense are by no means identical with the potential oil resources available to us. In the past, at least, oil fields in Latin America which were not discovered and developed by foreign enterprise were likely not to be discovered and developed at all.

On the other hand, so long as petroleum is being produced in Latin America—especially in the northern part—that production is likely to be available to us in a military emergency. And while we cannot directly pursue policies seeking to promote development of those resources, self-interest for the countries involved, if objectively examined by them, could act as a powerful ally in our favor.

Venezuela is the greatest petroleum producer of Latin America, ranking second in the world after the United States. Because of its small domestic requirements, its annual exports of petroleum have long exceeded those of the United States, even though its rate of production is about one-tenth that of the latter. For the time being it remains the leading petroleum exporter of the world, shipping some of its production to the United States but most of it to Europe. Its present proved reserves total about 6 billion barrels, and there seems to be promise of large future discoveries. Relations between the Venezuelan government and the private oil companies are generally satisfactory.[6]

Venezuela and the United States between them account for some 93 per cent of the total oil production of the Western Hemisphere, with another 5 per cent being accounted for by Mexico, Argentina, Colombia, and Peru. Trinidad, too, enjoys a fairly significant position, and the activity of Canada in oil production is definitely growing. Ecuador, Bolivia, and Brazil also produce oil, but in very small quantities. Some countries of the Western Hemisphere which are considered by geologists to have important oil potentialities are not commercial producers at all, due chiefly to the negative attitude of their governments toward the influx of foreign enterprise.

The case of Mexico is particularly interesting, since in 1921 its level of production (550,000 barrels a day) amounted to no less than 42 per cent of the production of the United States at that time. To be sure, the same wasteful methods of extraction which then prevailed in the United States were also used in Mexico, and decline in production began even before the period of increasing difficulties between the Mexican government and foreign operators. Nevertheless, the growing political risks retarded that search for new oil fields which is essential to sustained production, and prompted the industry to direct its exploratory efforts elsewhere. The final expropriation by the government of the oil properties in Mexico did not result in any reversal of the declining trend in production. Mexico has receded from second to sixth place in world production during the same period in which Venezuela rose from thirteenth to second. Nevertheless, Mexico still has proved reserves of over 700 million barrels, and its potentialities for future discoveries are considered very good.

Argentina is also interesting because it is the

6. Joseph E. Pogue, "Oil and the Americas" (Privately printed pamphlet, 1944).

only oil-producing state of Latin America which, despite rather extensive areas considered promising for oil development, fails to produce its own requirements. Although the private companies which originally opened the fields are still permitted to operate under restrictions, the oil industry in that country is for all practical purposes a government monopoly. Brazil, too, is a negligible producer despite great stratigraphic basins favorable for the occurrence of oil, and again this situation is due to laws unfavorable to outside private capital.

It may be that in the future the Latin American countries of high oil-producing potentiality will revise their attitudes concerning foreign enterprise—Mexico shows some indications of doing so already—but until they do so or until they demonstrate a greater efficiency of their own in internal development, the potential resources of South America are simply no resources at all. It can never be too much emphasized that fields must be discovered and developed before they are available to anybody. Failure to explore may be conservation for nature, but not for man.

Oil exploration and development in Latin America is generally not a low-cost enterprise, despite relatively low labor costs. As in the case of the Middle East, the oil fields are remote not only from markets—a relatively unimportant factor because of the cheapness of petroleum transportation by tanker and pipe line—but also from the sources of drilling and other equipment. Roads must be built and communities developed in the jungle, and the terrain is much less favorable than that of the Middle East to such pursuits. And of course the oil fields, while rich by Western Hemisphere standards, do not compare in potential productiveness to those of the Red Sea-Persian Gulf area.

AMERICAN SUBSTITUTE SOURCES OF LIQUID FUEL

In the immensity of our reserves of alternative or substitute sources of liquid fuel—such as natural gas, oil shale, tar sand, and various types of coal (including lignite)—we have a potential guarantee against shortage of liquid fuel in wartime. Under present processes of conversion, only natural gas can produce a gasoline which compares in price with fuels produced from crude petroleum, and the amount of low-cost natural gas available for conversion to gasoline is relatively small—estimated by one responsible research organization as equivalent to less than 2 billion barrels.[7] The next lowest cost sources by presently known processes are tar sand and oil shale, both existing in extensive deposits in North America—the tar sands, however, almost exclusively in the Athabaskan fields of Canada. But only relatively small proportions of these deposits are both accessible enough and rich enough in yield to make them a cheaper source than coal. And if, as is expected, the costs of coal conversion are more amenable to reduction than the costs of shale or tar sand conversion, coal will be able to compete with or displace in use most of the oil shale and tar sand deposits as soon as any large quantity of substitute motor fuel is required.

The ultimate available coal resources of the North American continent and especially of the United States are staggeringly huge. In the United States alone commercially available coal reserves—i.e., in workable seams above 3,000 feet depth and covering the range from anthracite to lignite—are scattered through twenty-nine states and are estimated to total 3.2 trillion tons. This compares with a present extraction rate of some 600 million tons per year. If 50 per cent of this coal were available for synthesis it would represent a potential gasoline reserve of 3.7 trillion barrels, or enough to last over 2,000 years at current American rates of liquid fuel consumption.

However, under present processes gasoline made from coal costs about three times as much at the refinery as gasoline made from petroleum, and while American research effort has already effected substantial cost-reducing improvement in the Fischer process (used by the Germans during World War II), no responsible specialist in the field predicts a refinery cost for the synthetic product much lower than twice that made from crude petroleum.

In considering the costs of synthetically produced fuel, one must always bear in mind that the differences in cost operate only through the refining stage, after which transportation and distribution costs—and taxes—should be exactly comparable to those of the present commodity. A 100 per cent increase in refinery costs might become by the time the commodity reaches the consumer a slightly more than 25 per cent increase in price. Naturally, in the case of other liquid fuels—such as those used for home heating, where retailing costs and especially taxes are substantially lower—the proportionate increase in price to the consumer might be much greater.

How important is the rise in price to the consumer? Some maintain that it is of little importance, that the car owner can be expected to pay

7. Standard Oil Research Corporation, "Preliminary Review of Cost and Availability of Motor Fuel from U.S. Non-Petroleum Sources" (mimeographed), December 3, 1943 pp. 1-6. The Standard Oil Research Corporation is a subsidiary of Standard Oil of New Jersey.

his five or six cents extra for each gallon of gasoline with no greater consequence than that of causing him to be less wasteful in his gasoline consumption. It would also put some pressure upon automobile manufacturers to design engines of greater efficiency, in which respect there is apparently a good deal of room for improvement over present designs. On the other hand, we know that in the aggregate the consumers of this country would be called upon to spend some hundreds of millions of dollars extra per year if they were obliged to use fuel produced synthetically or even from high-cost petroleum, and before we accept such a solution we should examine the alternatives. Certainly one alternative to the use of high-cost fuels is the peacetime exploitation of the vast resources of petroleum which exist outside the Western Hemisphere.

But before proceeding to consider those resources, one additional point must be made about synthetic production. If large-scale synthetic production should involve a refinery cost for gasoline approximately twice that of the present type of gasoline, it suggests that the price of crude petroleum could rise to approximately twice its present level before any large amount of synthetic production became commercially feasible on a competitive basis. Such high prices for crude petroleum would enable the oil industry, before yielding to coal its predominance in the field of liquid fuels, to bear much higher petroleum finding and recovery costs than it has thus far. Moreover, as crude petroleum tends to rise in price, it will be more exclusively devoted to uses for which it alone is specifically indicated—the net effect of which will be to stretch the utility of available petroleum. The combination of these factors means that even if cheap foreign petroleum were shut out of our domestic market by tariff or other means, the development in this country of a large synthetic industry might nevertheless be very considerably delayed. And until the plant is established, we cannot consider the synthetic product as available for emergency use.

OIL RESOURCES OF THE MIDDLE EAST

The large oil reserves of the world appear to lie in two main areas: the Caribbean-Mexican Gulf area, which includes the Southern United States, Mexico, the West Indies, and the Caribbean seaboard of South America; and the Middle East region, which includes the area lying generally between the Mediterranean, Red, Black and Caspian Seas and the Persian Gulf. Other oil-producing regions of the world, including the East Indies, are relatively of minor importance.

The present proved reserves of the Middle East outside of the Soviet Union total about 16 billion barrels. If one adds the "indicated reserves," that is, the reserves estimated to lie in fields already discovered but not yet fully explored, one arrives at a figure at least as large as the total proved and indicated reserves of the United States. However, exploration of the Middle East region has hardly begun. The DeGolyer Technical Oil Mission to the Middle East in a celebrated wartime report to the Petroleum Reserves Corporation made the following statement:

> "When one considers the great oil discoveries which have resulted from the meager exploration thus far accomplished in the Middle East, the substantial number of known prospects not yet drilled, and the great areas still practically unexplored, the conclusion is inescapable that reserves of great magnitude remain to be discovered. The proved and indicated reserves of this area are comparable with those of the United States, *yet all of the Middle East reserves have been discovered by the drilling of less than a total of 150 wildcat wells. In the United States we drill more than twenty times this number of wildcat wells each year.*"[8]

The experience gained by American oil companies on the spot since the DeGolyer report was issued—an experience which has embraced a very marked expansion of the actual production of the area—has served only to confirm the appraisal of the Technical Oil Mission. The 1946 average daily output of 588,000 barrels came from a very small number of wells. In Iraq alone 90,000 barrels per day were being produced from only ten wells operating at efficient rates, indicating an enormous shut-in capacity as well. It is at any rate clear that, long before the Middle East is as thoroughly tested as the United States has already been, its ultimate resources will be found to be enormously greater than those of North America.

Thus far the investments of American oil companies in the Middle East have not been large in relation to their total world investments. Recent estimates place their Middle Eastern commitment at about $250 million, which compares with a combined gross investment in properties, plants, and equipment of the thirty largest American oil companies amounting to some $12 billion.

Five of the largest American oil corporations are actively participating in the development and exploitation of Middle East petroleum, and the extent of their interest in the area is not to be meas-

8. Author's italics. This report, dated February 1, 1944 and signed by Mr. E. DeGolyer, was entitled "Preliminary Report of the Technical Oil Mission to the Middle East," but it remains in fact the only report prepared by that mission.

ured merely by the magnitude of their financial commitments thus far.[9] Just as a colt which turns out to be a winner of races is worth far more to his owner than his original purchase price, so also do the American owners view the worth of their concessions. The eagerness with which the Arabian-American Oil Company is promoting the laying of a large 1,000-mile pipe line across the Arabian peninsula from the Persian Gulf to the Mediterranean is only one indication of the great expectations with which the American oil industry views the Middle East.

The restraints upon acceleration of production since the war have been exclusively concerned with such matters as the scarcity of facilities to pump, store, refine, and especially to transport the petroleum, whether in crude or refined form. The most critical single shortage at the moment is in pipe, and remedy of that situation is retarded by scarcity of steel. The world tanker situation is also extremely tight, but the projected trans-Arabian pipe line will reduce the tanker haul of Persian Gulf oil to Northern European ports by almost 4,000 miles. The world-wide capacity of refineries must also be expanded before any great increase in Middle East production can be absorbed; such plants in the United States are already operating almost to full capacity and those of Europe have been badly damaged by the war. When these shortages are redressed, Middle East oil production will be limited only by the available market, or by possible threats of grave political disturbance such as might discourage the influx into the area of further venture capital. What is least at issue is the physical problem—or the cost—of discovering and recovering the oil in the ground.

CONCLUSIONS

THE ECONOMIC-STRATEGIC DILEMMA

The economic interest of America, from the point of view of industry as a whole and of all consumers as well as producers, lies primarily in an abundant supply of liquid fuels at as low a price as possible. This interest would dictate a policy of entirely free competition in oil production not only domestically, but also internationally —in other words a low tariff against crude petroleum (certainly not higher than the 10.5 cents per barrel currently effective as a result of our Trade Agreements program), and preferably no tariff at all. Our economic interest would dictate also a policy of encouraging American nationals to develop further the immense petroleum resources of the Middle East.

With this combination of policies we could expect Middle East production gradually to become an increasingly important factor in the supply of world markets, including our own. Domestic production would retain the competitive advantages not only of proximity to the world's most concentrated market and best source of supply for producing equipment and personnel, but also of operating within a stable and militarily secure political system that guarantees a maximum of protection to investments. It is likely that large integrated producers will always seek to hedge their riskier foreign holdings with substantial domestic holdings and activities. But as American production and especially exploration costs continued to rise in comparison with those of the Middle East—as they are bound to do—we should expect a slow tapering off of American production and eventually a situation where even the American market was supplied predominantly with foreign oil.

Under such circumstances the better American fields would certainly continue to operate profitably, although on a gradually diminishing scale. The American refining industry, too, would continue to flourish and possibly even to expand, though it would tend to grow more dependent on foreign rather than domestic crude oil production. But wildcatting would naturally tend to diminish in the relatively unpromising areas at home and would be encouraged instead to migrate abroad.

To what extent would our strategic interests be served thereby? Obviously the strain on our total American petroleum sources would be relieved. Petroleum would remain in the ground—and thus, presumably, available for oiling another war—which would otherwise be withdrawn and consumed for ordinary peacetime pursuits, including a vast amount of pleasure driving. Enough oil would certainly be saved to postpone indefinitely the need of recourse to synthetic production for war emergencies.

But there is one disturbing element which upsets our calculations. Oil in the ground is not necessarily oil available for war. The oil must first be discovered, and the plant necessary for its withdrawal must be developed. This process normally proceeds concurrently with the exploitation of proved reserves. In other words, what is important for a war emergency is not our total oil resources but our proved reserves, and not only our proved reserves but also the productive plant for their exploitation. Now, the building up of large proved

9. The five companies are Standard Oil of New Jersey, Standard Oil of California, Texas Co., Gulf Oil, and Socony-Vacuum.

reserves takes many years. During World War II it was our great good fortune that the immediate pre-war years had witnessed a rate of new discoveries which considerably outran current production, but the development of 20 billion barrels of proved reserves could not have taken place overnight. It could certainly not have taken place with anything like the rapidity with which we built up a huge airplane production plant or an equally vast shipbuilding output.

From the strategic point of view, the drawback of the program outlined above as most advantageous economically is that, unless qualified by special measures, it would put our domestic oil production on a liquidating basis as concerned proved reserves. For, as already pointed out, the activity which would be chiefly discouraged by a vast inflow of cheap petroleum from abroad would be not the production of those of our richer fields which are already proved and developed, but our domestic exploration. Production would diminish only gradually, but the rate of discovery of new fields might decline quite drastically. The net result would be rapid diminution in our fund of proved reserves. Under those conditions, a new war emergency would find us totally unable to fill our oil needs from American resources.

The solution most congenial to the independent oil producer, and perhaps the only practicable one, is that we must at all costs keep a crude oil production industry going in this country on a high level of operations. Under the conditions which will obtain in the future, that almost certainly means, not too distantly, a high tariff or quota system of protection on crude petroleum. The decision to force American demand to rely predominantly on American production will stimulate the most thorough kind of domestic exploration; and when, in the end, exploration becomes too costly in view of diminishing promise of new discoveries, demand will stimulate the creation of a large synthetic plant which, with supplementary crude oil production, will be adequate to fill our needs.

If that is the only answer, then the additional cost to the American consumer is not too great to be borne. The limit to what that additional cost will ultimately be is determined by the minimum cost of large-scale synthetic production from coal. If that means that the ordinary motorist's gasoline will cost him five cents more per gallon, then he must accept that additional cost in the same way and for the same purpose that he accepts the financial burden of his army, navy, and air force.

Unfortunately, however, the disadvantages of this plan are not economic alone. First, to promote domestic exploration by increasing, or at least maintaining, the rate of consumption of the domestic product is like trying to lengthen a rod by adding to one end while rapidly whittling away the other. Secondly, such a system would make the large-scale availability of secondary sources contingent on relative exhaustion of primary sources. Thus, when synthetic production does become our chief domestic source of liquid fuel, there will be no great fund of crude petroleum left to fall back upon. And since synthetic production is more costly than production from petroleum mostly because it requires a good deal more manpower, it is hardly the best kind of source to have to rely upon in wartime.

SUGGESTIONS FOR DOMESTIC POLICY

We are, therefore, on the horns of strategic dilemma, and the solution of this dilemma depends on a judicious choice among various alternatives. The thoroughgoing analysis upon which such a choice must be based has scarcely even begun. We do not, for example, know what can be accomplished by a system of subsidies. In theory, at least, the best and most rapid way of expanding our domestic proved reserves is to relieve the strain upon our domestic resources by permitting foreign oil to compete freely with domestic oil on the American as well as world markets, and at the same time to promote new domestic exploration, when necessary, by some system of government bounties. Only in that way can the apparently inevitable correlation be broken between cheap oil imports and languishing domestic exploratory activity.

Our Congress, to be sure, is allergic to the idea of subsidies, always prefering the concealed and much less efficient form of subsidy embodied in the protective tariff. In this attitude it is bound to be ardently supported by most of the American oil industry. And it must be conceded that the history of direct subsidies in the case of the outstanding example of its use to support an American industry—that of marine shipping—does not inspire one with the desire to see the practice generalized. On the other hand, the relatively indirect forms of subsidy devised to promote the expansion of the American air transport industry have been on the whole effective in achieving their purpose without encouraging rank dishonesty on the part of the recipients of the benefits. In any case, while subsidies may be wastefully administered, and are often devoted to ends of questionable value, most protective tariffs are inherently waste-

ful even as a means of securing the (usually wasteful) purpose for which they are devised. And in the case of petroleum we have seen that there are special objections to their use—the same kind of objections which apply to the use of tariffs to further exploitation and hence disappearance of any limited and irreplaceable natural resources.

It may be true, as some oil men have insisted, that it is impossible to devise an administratively feasible system of subsidies for encouraging genuine oil exploration.[10] But whether or not that proposition is true must be tested by study and experiment rather than prejudice, those responsible always bearing in mind the evils of the tariff alternative. The question is not a problem for this year or next. There are no present signs or diminishing exploratory activity in the United States and certainly not in the rest of the Western Hemisphere. It may be five years or more, depending on many factors affecting supply and demand, before the issues become critical. But if we are to have the answers when the critical time arises, there is no time like the present for beginning our study.

The same principle applies, although with less urgency, to the problem of promoting the development of a synthetic oil industry in the country. While the Bureau of Mines, in collaboration with the armed services, has already devoted substantial funds to research in this field, the burden of the work has thus far been carried by private industry. But private industry cannot reasonably be expected, without direct encouragement, to keep the nation's strategic interests paramount among its motives. And the expectation of economic benefits deriving from research in synthetics is contingent on expectation that none of the policies advocated in the paragraphs immediately above will be carried out. If the government should resist pressures to raise the tariffs on petroleum or petroleum products, or if it should begin considering ways of assisting domestic oil exploration, the interest of private industry in synthetic production of liquid fuels would certainly fail to develop and might even evaporate. Considered economically on a competitive basis, the feasibility of large-scale synthetic production depends on prices for crude petroleum reaching much higher levels than those prevailing today. From the strategic point of view, it might be desirable to lay at least the foundation for a synthetic industry as an emergency standby considerably before such levels were reached, and preferably to do so while taking measures to prevent their ever being reached.

The suggestions made above will no doubt prove offensive to those who believe ardently in keeping the government out of business. One can feel a good deal of sympathy—as does in fact the present writer—for the considerations and motives which underlie that conviction, without agreeing with the conviction itself so far as it concerns petroleum. The American oil industry provides one of the best historic examples of the conspicuous initiative, vigor, and resourcefulness to be realized only in a free enterprise system. Its growth and its accomplishments are alike phenomenal, inspiring not merely respect but awe. Nevertheless, the fact is incontrovertible that the nation, through its government, has a very special stake in its supply of liquid fuels; and while there is much in common between the nation's stake and that of the oil industry itself, there are important areas of divergence. An oil corporation, like any other corporation, would after all be derelict in its duties both to its stockholders and to its consumers if it consistently placed strategic considerations above considerations of profit. It would probably even cease to reflect the unique merits of private enterprise if it did so. One does not have to impugn the patriotic or other motives of the leaders of the industry to assert that the issues with which they are dealing are too important to be left to them alone.

NEW APPROACHES TO CONSERVATION

One of the most frequently used words in connection with oil exploitation is "conservation," the meaning of which has been permitted to remain highly ambiguous. To the oil industry the phrase "sound conservation" is more or less synonymous with "efficient production," and efficiency of production in any industry tends to be measured predominantly if not solely in terms of net monetary returns. A company producing crude petroleum is always interested in the most efficient production consistent with (a) maximizing the total long-term profit to be derived from the properties representing its current and potential reserves, and (b) meeting competition. Both these considerations will obviously result in the withdrawal from the ground of much less than the total which it is technically possible to withdraw.

The terrible wastage in the old days which commonly resulted from the unrestricted sway of the "rule of capture" has now been greatly modified by various state conservation laws coordinated under the Interstate Oil Compact. The system of pro-

10. The same oil executives are of course not averse to continuation of the present taxing policy favorable to exploratory activity—a policy which was threatened during the war—and would presumably look benignly upon changes designed to make that policy even more favorable.

ration operating under the Compact has been held up as a model of "regulation without regimentation," and indeed the system does have unique merits which entitle it to respect. The chief objection one can legitimately raise against it is that it does not go far enough. It relies fundamentally on the conservation laws of the individual states—which are after all competing with each other in terms of taxes and royalties—and some states have been conspicuously backward in producing and implementing the necessary legislation. The first basic question is whether state regulation is not fundamentally anachronistic in respect to exploitation of the nation's oil reserves. Equally basic is the question whether the criteria determining "sound conservation" should not be re-examined. Are we getting the most possible oil as well as the most out of our oil?

CONSERVATION IN CONSUMPTION

In general usage the implications of the term "conservation" as applies to petroleum are concerned exclusively with production. Perhaps it is time to concern ourselves with the problem of conservation on the consumption side. The United States has long been using about thirty times as much petroleum and petroleum derivatives per capita as the rest of the world, and about six times as much as the United Kingdom, which leads Europe in per capita consumption. Since World War II, the disproportion in per capita rate of consumption has undoubtedly been widened. Even the usually sober London *Economist* has questioned the "God-given right" of the American people to go on consuming some two-thirds of the world's total supply of petroleum.

But the Calvinistic approach would not necessarily mean greater availability of liquid fuel in a crisis. A production industry geared to a large civilian demand is an industry with large capacity —precisely what is necessary in an emergency. So long as we have practically unlimited nonpetroleum resources of liquid fuel to fall back upon when and if the time comes—not to mention the extraordinary petroleum resources of the Middle East—there seems on the surface to be little reason, moral or otherwise, to attempt to inhibit American consumption.

However, there are special possibilities of danger which demand attention. First, an expansion of civilian demand which was satisfied increasingly by imports from overseas would be a cause of embarrassment in the event of a sudden cessation during wartime of those imports. While civilian demand is generally elastic and subject to drastic downward revision during war, elasticity or flexibility are always relative. In general, the larger the peacetime demand, the larger the irreducible minimum of civilian consumption in wartime. The second point follows from the first. Different uses for petroleum products have widely varying degrees of elasticity. Demand for automobile gasoline is fairly elastic, not so much price-wise as in terms of government regulation.[11] Much ordinary driving either is for pleasure or is a luxury form of necessary transportation. The demand for liquid fuel for residential heating or for various forms of public transportation, however, is of quite another character.

An attempt on the part of government to influence civilian demand during peacetime hardly promises much success, and unless such an attempt were based on a most thoroughgoing analysis it might easily do more harm than good. On the other hand, any well-rounded oil policy could not afford to omit consideration, at least on the level of continuous scrutiny, of the consumption side of the issue.

AMERICAN INTEREST IN MIDDLE EAST PETROLEUM

The current great interest in the oil resources of the Middle East and the complexity of the issues affecting that area demand special comment. It is not arguing an isolationist policy concerning the Middle East to insist that the direct strategic value to the United States of those resources has been decidedly overstressed. Certainly the national interest in freeing and thereby expanding international trade and in securing optimum investment opportunities abroad for American nationals is one which can stand on its own feet. That interest is particularly marked in the case of a commodity like oil, of which the United States is by far the greatest consumer. Moreover, it is also clear from the foregoing pages that the oil of the Middle East is by no means without strategic significance to the United States, although in a different way from what has been generally assumed. What is important is that we keep clear in our minds the degree and character of the interests, whether economic or strategic or both, and that we distinguish between them with a view to determining what policies are worth their attendant risks.

The case for a strong American position in support of American nationals interested in developing and exploiting the oil resources of the Middle East has been admirably and eloquently stated, on predominantly economic grounds, by at least one

11. It is responsive also to cyclical fluctuations in income, but this point is not very relevant to our problem, except in so far as cyclical variations result in the creation of "excess" capacity.

State Department official.[12] His statement understandably plays down American strategic interest in the same pursuit, but we know from other observers of the policy-making machinery that strategic conceptions of a more or less random character have greatly influenced the policies in question.[13] To repeat, there is no reason why economic considerations should be unaccompanied by strategic considerations and vice versa, so long as there is a minimum of confusion between them. And to repeat further, the real strategic importance of Middle Eastern oil depends on how its exploitation affects the availability of domestic (i.e., Western Hemisphere) resources and facilities for the large-scale production of liquid fuels. In other words, strategic policy concerning Middle East oil is meaningless except in terms of the comprehensive domestic oil policy which is designed to supplement it.

There is one exception to the last stated proposition which may become an important and possibly a governing one. At the beginning of this paper the atomic bomb was in large measure dismissed from consideration on the grounds that governments could not yet feel they knew enough about its ultimate consequences upon strategy nor when those "ultimate" consequences might come into being. However, if in the course of further study it begins to appear that the only kind of large-scale conflict worth considering by strategic planners is one of intensive but brief hostilities, it would follow that the only militarily useful gasoline was that which was stockpiled beforehand in finished form. The many objections thus far raised against the feasibility of stockpiling petroleum or its products would not apply to such a situation. In that event, it would make relatively little difference where the stockpiled gasoline had originally come from. We could then, so long as the stockpile was provided, pursue a foreign oil policy which was largely divorced from strategic considerations. The atomic bomb threatens indeed to put a quietus on all our problems, but any slight gain on the credit side deriving from its existence is surely not to be scorned.

The problem of developing and implementing a coherent and comprehensive national oil policy remains before us. It must be an eclectic policy, and this report has attempted only to present some of the considerations by which its formation must be guided. The policy which eventuates must, if it is to be practical, take due account of what is or is not politically feasible. As in all policies worthy of the name, there must be a certain compromise between the theoretical ideal and the inevitable complex of prejudice and special interest which pursuit of the ideal activates. In the special case of petroleum, however, compromise can too easily proceed so far as to produce only a negation of policy.

12. John A. Loftus, "Oil in United States Foreign Policy," Department of State *Bulletin*, August 11, 1946, pp. 276-81.

13. See Herbert Feis, *Seen from E.A.* (New York, Knopf, 1947), pp. 93-190.

In the March 15 issue of FOREIGN POLICY REPORTS:

NATIONALISM IN BRITISH WEST AFRICA *by Vernon McKay*

Oil Resources of the U.S.S.R.*

By Bernard Brodie and Ruth Adamson**

The keen interest of the U.S.S.R. in the oil resources of the Middle East, especially of Northern Iran, has constituted one of the most disturbing and potentially dangerous factors in post-war relations between the great powers. It may be that the Soviet government is as much interested in keeping Western nations out of Northern Iran and as distant as possible from Russia's borders as in acquiring foreign oil resources for itself. There is no question, however, that the Soviet Union is laboring under a marked shortage of petroleum products—a shortage which requires some explanation in view of prevailing estimates of potential Soviet resources.

ESTIMATES OF SOVIET OIL

Some American geologists believe that the potential oil resources of the Soviet Union are much greater than those of the United States, despite the fact that Russian production today is not a tenth of our own. How reliable such estimates are is not certain, since the Soviet government, in recent years, has neither published relevant data nor admitted American oil geologists into the U.S.S.R. It is generally forgotten, however, that oil deposits were found in Russia before they were discovered in the United States, and that at the turn of the century Russia actually held the lead in world production, producing more than 50 per cent of the total of some 23 million tons annually and dominating the world export market. The great oil riches of the Baku region and other portions of the Caucasus are well known to foreign explorers, who developed them, and the Soviet government has discovered scores of new fields, claiming to have at its disposal greater prospective resources than any other one country. As much as ten years ago Soviet authorities placed their country's proved and prospective reserves at some 2,880 million tons (or 21.6 billion barrels), and recent estimates of foreign observers have placed Russia's proved reserves alone at around one billion tons (7.5 billion barrels).

Why, then, is Russia suffering from oil shortage? The history of Soviet oil exploitation since the revolution furnishes an excellent insight into the basic difficulties which beset the Soviet economy. It was not until 1926 that crude oil production in the Soviet Union reached again the 1913 level of 9.2 million tons, and this recovery was achieved through the large-scale employment of American engineers and equipment. After the inauguration of the first Five-Year plan in October 1928 progress became more rapid, and the original goal of 21.7 million tons for 1932 was attained within two and one-half years. The level of production actually reached in 1932 was 26.5 million tons.

OVERUSE OF "FLUSH" WELLS

Meanwhile, the collectivization and mechanization of agriculture and the development of industry generally had created a sharply rising domestic demand for petroleum products. As a result, the second Five-Year plan set a goal of 69.2 million tons by 1937. The complete collapse of these aims (only 27.6 million tons annually were actually being produced by 1937) threw some light on certain aspects of the first Five-Year plan. It was then revealed that the expansion under the first plan had been achieved by the most wasteful exploitation of the Caucasus oil fields. Production had been excessively concentrated upon "flush" wells, without regard to operating efficiency. This had resulted in the premature exhaustion of some of the richest producing strata and in irreparable damage of the fields.

For the third Five-Year plan the Soviet authorities set the relatively modest goal of 54 million tons. Owing to the discovery and development of new fields in various parts of the Soviet Union, this goal would probably have been achieved had not the war with Germany intervened. But the heavy damage inflicted by the Germans to the Maikop and Grozny fields and refineries, and the relapse in the yields of the Baku wells resulting from the sharp contraction in drilling caused a fall in output from which the industry has not yet recovered. Production at the end of 1947 probably reached a level of about 26 million tons annually, representing recovery from a low of about 18 million.

Stalin has declared it a vital necessity to raise oil production to at least 60 million tons (380 million barrels) by 1960. That goal would not be too high for an industry working under normal conditions and disposing of Russia's natural resources. But under existing conditions, with a marked lack of newly developed reserves and shortage of equipment in the Soviet Union, that goal is likely to prove an impossibly high one. Under these circumstances, the lush oil fields presumed to lie in Northern Iran must seem particularly valuable to the U.S.S.R.

*This article is based largely on "Thirty Years of Soviet Oil," *Petroleum Press Service* (British), vol. 14, No. 12, pp. 273-76. For informed estimates of proved reserves and rates of production, region by region, within the Soviet Union, see the "1947 World Oil Atlas" issued by *The Oil Weekly*.

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